Interactions Lab

Introduction

In this lab you will investigate the interactions occurring inside of organisms, a plant & a human. You will first investigate the process of Transpiration in plants, highlighting various interactions involved in the process. Second, you will investigate animal process interactions, again highlighting various interactions involved in the process.

Part 1 – Plant Transpiration

A. You will **explain the interactions in transpiration**. Information can be found in Ch.36 in the textbook & via online searches. The interactions requiring explanations are listed below.

Interaction Type	Specifics to Address
1. Intramolecular Interactions	Intramolecular structures of: Water, Cellulose
2. Intermolecular Interactions	Interactions between Water & Cellulose of Cell Wall
3. Intracellular Interactions	Guard Cell Opening & Closing Mechanisms (Interactions between Water, Ions & Vacuoles in the cell)
4. Intercellular Interactions	Movement of water between 2 cells via Apoplastic Route, Symplastic Route, & Transmembrane Route.
5. Organ & Organ System Interactions	Transport of water from soil to roots, Transport of water from roots to stems, & Transport of water from stems to leaves.
6. Organism & Abiotic Environment Interactions	Make a null hypothesis about how **each** of the following independent variables would affect the dependent variable of plant transpiration rate: Humidity, Wind, Light Intensity or Temperature

B. You will **conduct an investigation about how plant transpiration can be affected by ONE environmental factor** you made a hypothesis about in Part "A" above. These procedures are highlighted in the "*Whole-Plant Transpiration Method Lab*" handout. No formal report is required; you will only perform the lab & analysis as stated in the handout after Spring Break.

Part 2 – Animal Homeostasis Mechanisms

Various chapters in the textbook (41, 44 & 45) will be useful references along with other online searches.

The components to be described are listed in the table below. There is no Lab component for this section. See the worked example on the following page for assistance.

Interaction Type	Water Homeostasis Interactions to Address
1. Intramolecular Interactions	**ADH Structure Interactions.** **Water Structure Interactions.**
2. Intermolecular Interactions	**Explain how the interactions between ADH and the cell membrane make signaling via transduction pathways necessary.** **Explain how the interaction between water & cell membrane make transport via aquaporin channels necessary.**
3. Intracellular Interactions	**Describe 2 intracellular events for the ADH signaling process.** **Explain the movement of water based on water potential.** **Describe the function of 2 organelles in the process.**
4. Body System Interactions	**Describe the pathways in context of molecule interactions with the organs in the pathways.**
5. Environmental Interactions	**Describe what stimuli trigger the pathway & how regulated.**

Blood Glucose Homeostasis Interactions Example:

Insulin Structure Interactions.

THE BASIC STRUCTURE OF INSULIN IS A PROTEIN. ALL PROTEINS ARE MADE OF DIFFERENT AMINO ACIDS THAT INTERACT TO FORM A COMPLEX 3D SHAPE. AS A PROTEIN, IT FORMS INITIALLY BY PEPTIDE BONDS, AND THEN HYDROGEN BONDS HOLD TOGETHER SECONDARY COILS & FOLDS. INSULIN HAS TERTIARY STRUCTURE FORMING FROM DISULFIDE BONDS, AND MANY TIMES A FULLY FUNCTIONAL INSULIN PROTEIN IS A DIMER (2 POLYPEPTIDES JOINED) OR A HEXAMER (SIX POLYPEPTIDES JOINED).

Explain how the interactions between insulin and the cell membrane make signaling via transduction pathways necessary.

PROTEINS ARE MACROMOLECULES AND ARE THEREFORE TOO LARGE TO CROSS THE CELL MEMBRANE; THEREFORE, THEY MUST ACT AS A LIGAND TO CAUSE A TRANSDUCTION PATHWAY INSIDE A TARGET CELL.

Describe 2 intracellular events for the signaling process.

THE INSULIN RECEPTOR IS ACTIVATED BY INSULIN. THE ACTIVATED RECEPTOR STIMULATES A PHOSPHORYLATION CASCADE.

Describe the function of 2 organelles in the process.

THE NUCLEUS CONTAINS THE GENES FOR INSULIN TRANSPORT PROTEINS NEEDED FOR GLUCOSE UPTAKE INTO CELLS. THESE TRANSPORTERS ARE SYNTHESIZED IN THE ENDOMEMBRANE SYSTEM AND TRANSPORTED TO THE MEMBRANE BY VESICLES.

Describe the pathway in context of molecule interactions with the organs in the pathways.

GLUCOSE LEVELS IN THE BLOOD RISE AFTER EATING, TRIGGERING THE PANCREAS TO SECRETED INSULIN. INSULIN SIGNALS BODY TISSUES TO INCREASE ABSORPTION OF GLUCOSE & THE LIVER IS TRIGGERED TO STORE GLUCOSE AS GLYCOGEN.

Describe what stimuli trigger the pathway & how regulated.

THE LEVELS OF GLUCOSE THEMSELVES TRIGGER THE PATHWAY. THE RISE AND FALL OF GLUCOSE ARE REGULATED BY NEGATIVE FEEDBACK BY INSULIN AS DESCRIBED ABOVE, AND ALSO BY THE HORMONE GLUCAGON IN A SIMILAR NEGATIVE FEEDBACK MECHANISM TO CONTROL LOW BLOOD GLUCOSE LEVELS.